

Remarks

Claims 1-19 were pending in the subject application and remain before the examiner. Favorable consideration of the claims now presented, in view of the remarks set forth herein, is earnestly solicited.

Claims 1-6 and 14-19 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Lowe *et al.* (U.S. Patent No. 5,989,923), Stephens *et al.* (GB Patent No. 2054995 A), and Yin *et al.* (U.S. patent No. 5,499,117). The applicants respectfully traverse this ground for rejection because the cited references, taken either alone or in combination, do not teach the claimed invention.

The Action states at page 4 that Stephens *et al.* teach a unit of optical fibers for transmitting light to and from a hologram and that it would have been obvious to modify the device of Lowe *et al.* to include this feature of Stephens *et al.* The applicants respectfully disagree.

Stephens *et al.* disclose the use of concave reflectors comprising variations in refractive index through the thickness (holographic reflectors), which via constructive interference reflect light of a predetermined wavelength in a given direction. The wavelength is different for each of the reflectors. The predetermination of the wavelength and the requirement to reflect only a very narrow spectral range are prerequisites for the proper functioning of the optical encoder in Stephens *et al.*

There are numerous differences between the teachings of Stephens *et al.* and the subject invention. For example, Stephens *et al.* disclose a means for mechanical measurements of position while the subject invention discloses a means for measuring a hologram with alterable characteristics. Also, Stephens *et al.* teach a rigidly fixed optical arrangement of the fiber source/detector assembly and the holographic elements, and the subject invention teaches a device which can operate over a range of angles and distances from a holographic element. The Stephens *et al.* system is expected to be used without interposing material between the fiber sensor/detector assembly and the holographic element while the subject invention is devised to function with interposing scattering media down to where only low levels of reflected light exist.

Moreover, Stephens *et al.* include a set of individually defined holographic reflectors, each prepared to reflect a single predetermined wavelength, but the subject invention has a single holographic reflector which changes its wavelength reflecting properties depending on its contact

with an analyte of interest. In addition, Stephens *et al.* teach that the holographic reflectors are designed individually to reflect light of the narrowest possible bandwidth in order to maximize the number of channels which can be used in the device and improve its precision. On the other hand, the subject invention discloses a reflector that is capable of reflecting light across a range of wavelengths corresponding to the changing responsive state of the holographic element.

The following table summarizes some of the key distinctions discussed above between Stephens *et al.* and the subject invention.

	Stephens	The Present Invention
1	a means for mechanical measurements of position	a means for measuring a hologram with alterable characteristics
2	a rigidly fixed optical arrangement of the fiber source/detector assembly and the holographic elements	a device which can operate over a range of angles and distances from a holographic element
3	a system which is expected to be used without interposing material between the fiber sensor/detector assembly and the holographic element	designed to function with interposing scattering media down to where only low levels of reflected light exist
4	a set of individually defined holographic reflectors, each prepared to reflect a single predetermined wavelength	a single holographic reflector which changes its wavelength reflecting properties depending on its contact with an analyte of interest
5	the holographic reflectors are designed individually to reflect light of the <u>narrowest possible</u> bandwidth in order to maximize the number of channels which can be used in the device and improve its precision	the reflector is capable of reflecting light across a range of wavelengths corresponding to the changing responsive state of the holographic element

There is nothing in the Stephens *et al.* reference, or in the related art, to teach or suggest that the use of non-planar reflectors would provide a basis for the present invention, which has the requirement to operate effectively over a range of angles/distances/wavelengths and interposing scattering media. The Action does not establish that a person of skill in the art would either look to the Stephens *et al.* reference for, or find in it, a solution to this problem. The applicants respectfully submit that the assertion that it would have been obvious to modify the teachings of Lowe *et al.* with a unit of optical fibers of Stephens *et al.* is based on hindsight. Hindsight reconstruction of the prior art cannot support a §103 rejection, as was specifically recognized by the CCPA in *In re Sponnoble*, 56CCPA 823, 160 USPQ 237, 243 (1969). In fact, the substantial differences between Stephens *et al.* and the present invention mean that a skilled artisan would not have reasonably expected that the Lowe *et al.* sensors could be modified by the teachings of Stephens *et al.* to provide an apparatus or method with properties suitable for use as claimed.

The method of the invention inherently defines a way of remotely interrogating a hologram reflecting wideband wavelengths from a range of angles and distances through an interposing scattering medium. The Stephens *et al.* reference is of no essential utility in informing the skilled person how to achieve this invention as a whole.

The Action states at page 5 that Yin *et al.* teach a non-planar surface that is convex and/or concave and that it would have been obvious to modify the hologram substrate of the modified Lowe *et al.* reference to have curvature as taught by Yin *et al.* The applicants respectfully disagree.

Yin *et al.* discloses a means of recording a hologram on a non-planar surface and a method of transferring the hologram to another identical surface. The purpose of Yin *et al.* is to overcome potential difficulties with having to place a recorded holographic film on a surface of an object which cannot be used as a recording substrate, for example because it is flexible (see, e.g., Background section of Yin *et al.*).

The recording material is cast onto a rigid substrate having the same non-planar properties as the final substrate, together with other layers to facilitate subsequent release of the recording layer, and then the hologram is recorded. As a skilled artisan would understand, it stands as a fundamental fact that, when illuminated, the fringes formed in the non-planar holographic layer will reconstruct

an image of the object recorded. Yin *et al.* disclose that the hologram is recorded in the conventional way, and so can be of any object. The exposure surface is transparent (see column 2, line 15 of Yin *et al.*). A skilled person, bearing in mind the application for providing head up displays and the like, would understand that the hologram would be recorded in transmission mode, where laser light scattered from an object external to the assembly shown in Figures 1-4 interferes with a reference beam propagating though the substrate to form fringes in the recording layer. A complex image gives rise to complex fringes, but in all cases the shape of the fringes does not depend on the shape of the recording layer. When the layer is transferred to the final surface, the non-planar characteristics of the fringes are preserved, and thus the image is reconstructed accurately.

Only if the exposure surface of Yin *et al.* was reflective (of which there is no disclosure or suggestion) would the hologram be recorded in reflection mode and give rise to fringes which would reconstruct a convex/concave mirror. However, there is neither any disclosure of this nor any application of it. As such, Yin *et al.* discloses only that any image can be reconstructed in a non-planar film, and says nothing about the retro-reflecting properties of a hologram recorded using a concave or convex mirror. A skilled person would therefore have no motivation to look to the Yin *et al.* reference because modifying the hologram substrate of Lowe *et al.* with the curvature of Yin *et al.* would merely lead to a sensor comprising a holographic recording of any object in a curved layer which would not have the retro-reflecting properties necessary for the present invention.

As discussed above, a skilled artisan would not have had a reason to look to Stephens *et al.* or Yin *et al.* to modify the teachings of Lowe *et al.*, nor would a skilled artisan, having found Stephens *et al.* and/or Yin *et al.*, have been motivated to actually make the modifications to Lowe *et al.* discussed at pages 4 and 5 of the Action. As the Examiner is aware, the mere fact that the purported prior art could have been modified or applied in some manner to yield an applicant's invention does not make the modification or application obvious unless "there was an apparent reason to combine the known elements in the fashion claimed" by the applicant. *KSR International Co. v. Teleflex Inc.*, 550 U.S. 550 U.S. 398, 127 S. Ct. 1727, 82 U.S.P.Q.2d 1385 (2007). Also, an applicant's invention is not "proved obvious merely by demonstrating that each of its elements was, independently, known

in the (purported) prior art.” *Id.* In this case, one of ordinary skill would not have had any reason to turn to Stephens *et al.* or Yin *et al.*, let alone to modify Lowe *et al.* with their teachings.

Accordingly, the applicants respectfully request reconsideration and withdrawal of the rejection of claims 1-6 and 14-19.

Claims 7-13 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Lowe et al. in view of Stephens et al. and Yin et al., as applied to claims 1 and 5 above, and further in view of Mizutani et al. (U.S. Patent no. 6,483,611). The applicants respectfully traverse this ground for rejection because the cited references, taken either alone or in combination, fail to teach the claimed invention.

The deficiencies of the combination of Lowe *et al.*, Stephens *et al.*, and Yin *et al.* have been discussed above. Mizutani *et al.* do not cure, or even address, these deficiencies. A skilled artisan would not have had a reason to turn to Stephens *et al.* or Yin *et al.*, let alone modify Lowe *et al.* with their teachings.

Accordingly, the applicants respectfully request reconsideration and withdrawal of the rejection of claims 7-13.

In view of the foregoing remarks, the applicants believe that the currently pending claims are in condition for allowance, and such action is respectfully requested.

The Commissioner is hereby authorized to charge any fees under 37 CFR §§1.16 or 1.17 as required by this paper to Deposit Account No. 19-0065.

The applicants also invite the Examiner to call the undersigned if clarification is needed on any of this response, or if the Examiner believes a telephone interview would expedite the prosecution of the subject application to completion.

Respectfully submitted,



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Attachment: Request for Continued Examination